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Observations on the Nesting Biology of *Andrena* (*Plastandrena*) *prunorum* Cockerell in Washington State (Hymenoptera: Andrenidae)

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ABSTRACT: Nesting and associated behaviors of *Andrena* (*Plastandrena*) *prunorum* Cockerell were studied at two sites in western Washington: a suburban lawn and a vacant lot. A maximum of five nests, usually well separated from one another, was found at a given site and year. Nest and cell structure at both sites were similar, but cell depth differed markedly between sites, and between years at one site. All nests were multi-cellular. Provision masses were flattened spheres of pollen moistened to a doughy consistency. The curved egg was placed atop the provision mass with both ends contacting it. A brief description of larval feeding is provided. *Andrena prunorum* and its *Nomada* parasite overwinter as adults. Nests, cell, provision mass, egg placement, and a feeding larva are illustrated. Information on mating, female foraging behavior, and local pollen sources are given. Adult phenology and the possibility of two generations per year are discussed. *Nomada* sp. nr. *calloxantha* Ckll. parasitized *A. prunorum* at one site and larval feeding by the cleptoparasite is described.

KEY WORDS: *Andrena prunorum*, Andrenidae, nesting biology, phenology, behavior, *Nomada* cleptoparasite, Washington State

Members of the large, solitary bee genus *Andrena*, which contains as many as 1300 species, occur throughout the northern hemisphere (Michener, 2000). Few species, however, have received detailed biological or behavioral study, and even our knowledge of the species in several entire subgenera, of which there are many, remains largely restricted to information on distribution and floral visitation. Nevertheless, excellent reports are available on several species and can serve as an introduction to the biology of *Andrena* and direct interested readers to additional literature. These include Michener and Rettenmeyer (1956), Schrader and LaBerge (1978), Schonitzer and Klinksik (1990), Witt (1992), and Batra (1999).

Andrena (*Plastandrena*) *prunorum* Cockerell is a common, large *Andrena* of western North America that exhibits much color variation, and two subspecies have been recognized (LaBerge, 1969). *Andrena p. sinaloa* Viereck are dark bees known from a few locations, primarily in northern Baja California. *Andrena p. prunorum* Cockerell, the subject of this report, is found throughout western North America. It ranges from Edmonton, Alberta, Canada in the north to southern California, Arizona, and New Mexico, and from the Pacific coast to the western extremities of the Dakotas, Nebraska, and Texas (LaBerge, 1969).

Nesting biology and associated behaviors of *A. p. prunorum* were studied at two sites in Washington State west of the Cascade Mountains, and additional observations on phenology and floral visitation were made in the eastern part of the state. Information about nest and cell structure, provisions, immature stages, adult behavior, and a *Nomada* cleptoparasite is reported.

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Materials and Methods

Five nests of *A. prunorum* were discovered in 1985 and one nest was found in 1990 in a maintained suburban lawn within the city of Edmonds, Snohomish Co. Three nests were discovered in 1988 in a vacant lot 9.7 km north of Poulsbo, Kitsap Co. (23 km west of the Edmonds site). Both sites are west of the Cascade Mountains. All nine nests were excavated. Observations of female activity at the Edmonds site were made for part or all of the day on 16, 17, and 21 May 1985. Additional observations at this site were made on 28 March 1992. Extensive observations of adult activity were not made at the Kitsap Co. site. Observations and collections of *A. prunorum* were made on an impromptu basis at various sites in Yakima County, east of the Cascade Mountains, between 1996 and 2006. Sites ranged in elevation from ca. 450 to ca. 650 m.

Field observations were recorded on a cassette tape player for later transcription. A digital watch was used to time bee activities to the nearest second. All times are Pacific Daylight Savings Time, unless otherwise indicated. Temperature during nest site observations was monitored in the shade with a mercury thermometer. In addition, notes on cloud cover and estimates of wind speed were made periodically especially when changing conditions appeared to affect bee activity. Nests were excavated with small knives and trowels by carefully following the main burrow. Field measurements of nest dimensions were made with a metric ruler to the nearest 0.5 cm. Sketches of nest architecture were made in the field, and blocks of soil containing burrows and cells were removed for more careful subsequent examination. Dimensions of cells and provision masses were determined to the nearest 0.1 mm with Vernier calipers. Weights of provision masses were determined to 0.001 g with a Sartorius electronic balance. Larvae of *A. prunorum* and its parasites were held at room temperature in their natal cells for rearing. Cells were placed on a layer of soil in tightly closed plastic containers, and the soil was moistened periodically to maintain high relative humidity.

One-way ANOVA was used to test for differences in length of pollen foraging trips by three females observed on 17 May 1985 and for differences in length of stays within the nest between pollen foraging trips by the same bees.

Results

NESTING SITES: The Edmonds nesting site was illustrated and described previously (Miliczky and Osgood, 1995). *Andrena (Melandrena) vicina* Smith also nested at this site and was much more abundant than *A. prunorum* (100 or more nests) (Miliczky and Osgood, 1995). The five, 1985 *A. prunorum* nests were separated from each other by at least 1 m and were distributed among those of *A. vicina*, as was the 1990 nest.

The Kitsap Co. site was also described previously (Miliczky, 2000) and was likewise utilized by other species of ground-nesting Hymenoptera. The most numerous bee was *Melissodes* (*Eumelissodes*) *microsticta* Cockerell with about 200 nests in 1988 (Miliczky, 2000). The *A. prunorum* nests were separated from the main concentration of *M. microsticta* nests by several meters. Vegetation at this non-irrigated site was mowed at irregular intervals.

PHENOLOGY: *Andrena prunorum* was first noted at Edmonds on 15 April 1985 when two males were collected. Two days later two males and two females with pollen in their scopae were collected on flowers of a cruciferous weed about 25 m from the nesting site. Each of the four females under observation on 16, 17, and 21 May 1985 was seen to return to its nest with pollen. A nest excavated on 23 May revealed the dead resident bee partially within the most recently provisioned, but unclosed cell. Four of the five cells found in the last 1985 nest to be excavated (15 June) contained pupae. Nesting activity probably ceased well before this date. Two females were reared from excavated cells, adult emergence occurring prior to 21 July 1985 (exact date not determined). Several males, a female, and a mating pair observed on 28 March 1992 at Edmonds appeared very fresh, indicating an early stage in the adult activity period.

Provisioning activity at the Kitsap Co. site was observed on 17 July 1988 when two bees returned to their nests with pollen. Both were alive on 22 July 1988 when their nests were excavated. Thus *A. prunorum* was actively nesting at this site in 1988 more than a month after nesting had ceased at the Edmonds site in 1985.

The earliest collections of male *A. prunorum* in Yakima County were made on 2 April 2002, 8 April 1998, and 8 April 2003. All specimens were in nearly pristine condition indicating dates close to the beginnings of the species' active season. The earliest female was collected on 28 April 1998 and she was in nearly pristine condition. The latest Yakima County collection was 3 July 2002 when *A. prunorum* was found in some numbers around flowering *Philadelphus lewisii* Pursh (Hydrangeaceae) shrubs. Six of 12 males had completely frayed wing margins, but the other six, and the three females, had wing margins unworn or with only a nick or two. Adults thus appear to be active in Yakima County from early April to early July, perhaps considerably later in some years based on the relatively unworn wings of several of the 3 July 2002 bees.

MALE BEHAVIOR: Male *A. prunorum* were observed in Yakima Co. patrolling cultivated cherry, peach, pear, and apple just before and during bloom. Similar activity was observed at uncultivated apple and at native shrubs and trees including *Amelanchier alnifolia* (Nutt.) Nutt., *Prunus* sp., *Holodiscus discolor* (Pursh) Maxim. (all Rosaceae), *Berberis aquifolium* Pursh (Berberidaceae), *P. lewisii*, and *Artemisia tridentata* Nutt. (Asteraceae). All plants were in bloom or just pre-bloom, except *A. tridentata* which flowers in the fall. The earliest instance of male patrolling was 8 April 1998 on *Prunus* sp. and the latest was 3 July 2002 on *P. lewisii* (see above).

A mating pair was observed at the Edmonds site on 28 March 1992 at 14:56 PST, a sunny but cool day (shade air temperature = 13°C). The pair rested on a leaf in the sun about 2 m above ground, less than 10 m from the nesting site. The male did not grasp the female with his legs or mandibles during the period of observation but maintained contact via his genitalia. He was curled above her and intermittently vibrated his wings. The observation lasted nearly one minute, but the pair flew off in tandem when I approached too closely. A second mating pair was spotted about 11:30 on 16 June 2001, 17.5 km NNE Selah in Kittitas Co., near the Yakima River. They were resting on a flowering *P. lewisii* shrub. A third pair was seen on the morning of 14 May 2003, 15 km NNE of Selah in Kittitas Co., again near the Yakima River. The bees rested on a leaf of a flowering *Prunus virginiana* L. (Rosaceae) shrub about 1.5 m above ground in the sun. The position of the two bees was similar to that of the Edmonds pair.

FEMALE BEHAVIOR: Female *Andrena prunorum* foraged actively at the Edmonds site on 16, 17, and 21 May 1985. Shade air temperatures between 09:00

and 17:00 ranged from 16°C to 20°C and winds were calm. Nests were in the sun from 09:00 until after 17:00.

Orientation flights preceded 17 of 33 nest departures, lasted up to 60 sec, and described a roughly figure-of-eight pattern about the nest. Bees sometimes continued to orient on the nest at distances exceeding 5 m. Despite orientation flights it was not unusual for bees to have difficulty locating their nests in the dense grass.

LaBerge (1969) concluded that *Andrena prunorum* is a polylectic bee and listed 77 host plant genera in 32 families. Additional hosts were given by Tepedino (1982). Potential host plants in the vicinity of the Edmonds site included fruit trees and ornamental and weedy plants. Females collected pollen from *Cornus nuttallii* Audobon (Cornaceae) and an unidentified species in the Cruciferae within 50 m of the nesting site. Pollen sources at Kitsap Co. were not determined, but due to the later period of observation (July) would have included a different set of plants. The most abundant nearby plant in flower, *Hypochaeris radicata* L. (Asteraceae), was not confirmed as a pollen source. In Yakima Co. *A. prunorum* collected pollen from *Holodiscus discolor*, *Prunus virginiana*, *Crataegus douglasii* Lindl. (Rosaceae), *Calochortus macrocarpus* Dougl. (Liliaceae), *Sisymbrium altissimum* L. (Cruciferae), and *Philadelphus lewisii*.

Thirty pollen collecting trips by the 1985 Edmonds bees averaged 1327.2 sec (=22 min 7 sec) in length (standard deviation: 935.65, range: 525–4363). A complete day's foraging activity for three bees was observed on 17 May. The first nest departure of the day was noted for each bee, and all three ceased foraging before observations ended. One bee collected six pollen loads in 3 hr 20 min, a second collected five loads in 2 hr 54 min, and a third required 1 hr 47 min also to collect five loads. Differences in foraging trip length for these bees were not significant ($F_{[2,13]} = 0.55$). One trip, apparently for nectar only, lasted 59 min 39 sec.

Bees spent an average of 816.1 sec (=13 min 36 sec) (standard deviation: 380.2; range: 452–1792 sec) inside the nest between successive pollen collecting trips during which time pollen was removed from the scopae. Stays within the nest by the three 17 May bees (referred to above) did not differ significantly in length ($F_{[2,9]} = 1.48$). One open cell contained provisions that had been shaped and moistened but appeared incomplete, suggesting that each successive pollen load is incorporated into pollen already present in the cell.

Nest entrances remained open while bees foraged. However, a soil plug was observed in a nest entrance on two occasions late in the day (ca. 15:20), presumably after foraging had ceased, and on three occasions early in the day (ca. 09:00) presumably before foraging had begun.

NEST ARCHITECTURE: Tumuli at Kitsap Co. were roughly circular in shape and reached 7.5 cm in diameter and 2 cm in height. They were poorly concealed by vegetation. At Edmonds, however, tumuli were well concealed by the dense vegetation, which also restricted their lateral spread, and a maximum diameter of 3.5 cm was recorded. One nest at each site had been dug near the base of a *Hypochaeris radicata* plant (Fig. 7). Nest entrances at both sites were located near the center of the tumulus and were 6–7 mm in diameter. The main burrow passed vertically through the tumulus in all cases. Nests were usually well separated from one another. Nearest neighbor distances ranged from 20 cm to 10 m.

Soil at the Edmonds site was firmly packed sand with numerous stones up to three cm in diameter. It is classified as Alderwood-Urban land complex (United States

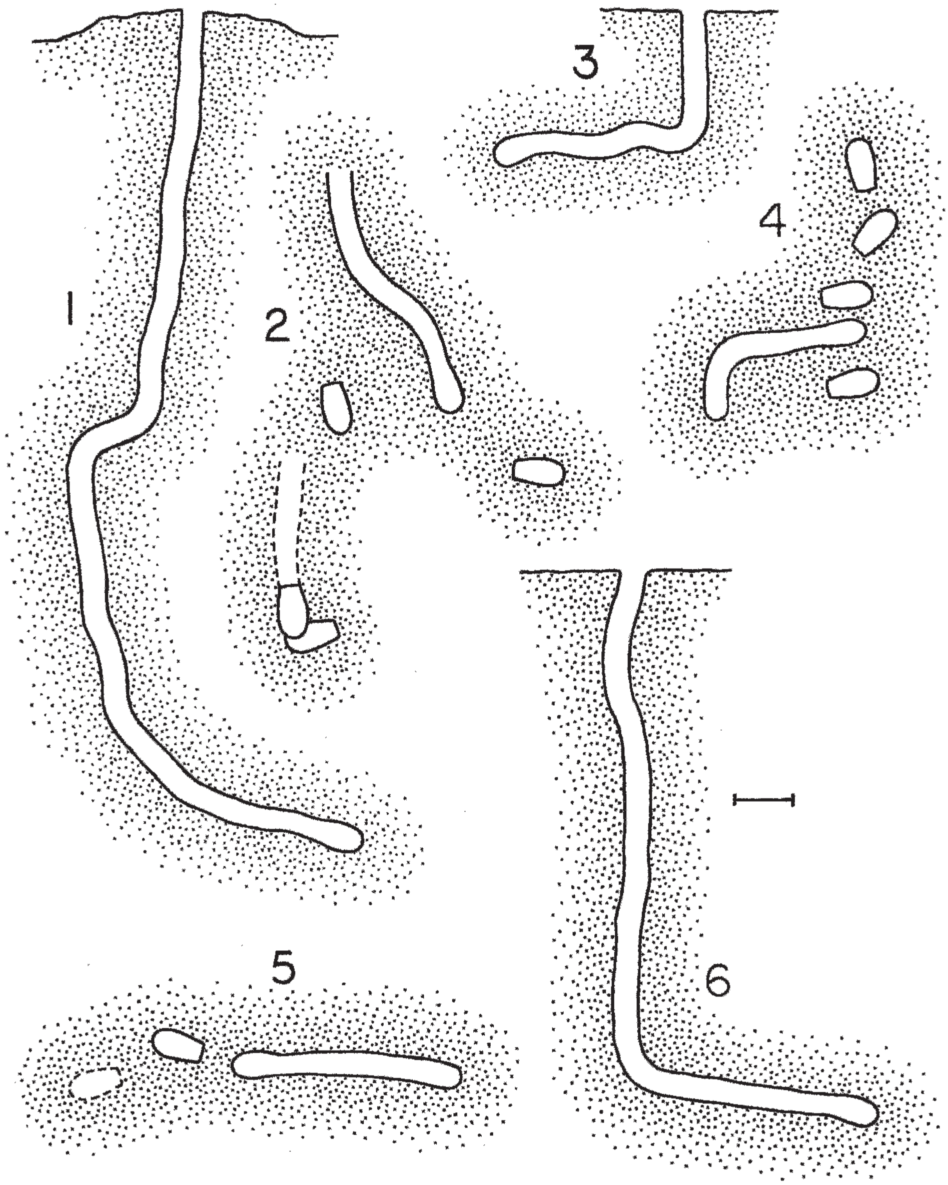
Department of Agriculture, 2007). Main burrows descended vertically a short distance before bending toward the horizontal (Fig. 3). The five 1985 nests were of interest because of the shallowness of their cells. Mean cell depth was only 7.5 cm (range: 5.5–10.0 cm; $n = 31$) (Fig. 3). At these depths the cells were still within a zone of dense root growth. Single cells were constructed at the ends of horizontal to shallowly descending lateral burrows and were 6.0 cm to 11.5 cm horizontal distance from the nest entrance ($n = 17$). Depth of the cells within a nest varied only slightly, and there was a tendency for most cells in a nest to be constructed within a limited sector around the main burrow. Two cells were sometimes separated by as little as 2–3 mm of soil. The 1990 nest differed primarily in the greater depth of its cells: 18 cm, 18 cm, and 24 cm (Fig. 6).

Soil at the Kitsap County site was also sandy but with stones less numerous than at Edmonds. It is classified as Ragnar fine sandy loam (United States Department of Agriculture, 2007). A thin, scattered layer of organic debris covered the surface. The upper 1–2 cm of the soil was loosely consolidated, but below this it was firmly packed and of uniform consistency to cell depth. Root growth was less dense than at Edmonds. The soil was dry to a depth of 20–25 cm, but below this it was slightly moist. All cells occurred in the moister soil. Main burrows entered the ground almost perpendicular to the surface and descended to cell depth at steep angles with some gentle meandering and an occasional more abrupt bend (Fig. 1). Burrow diameter was 8 mm. Mean cell depth, at 34.2 cm (range: 25–39 cm; $n = 19$), was markedly deeper than at Edmonds. The maximum range in cell depths within a nest was 9 cm (eight cells between 30 cm and 39 cm).

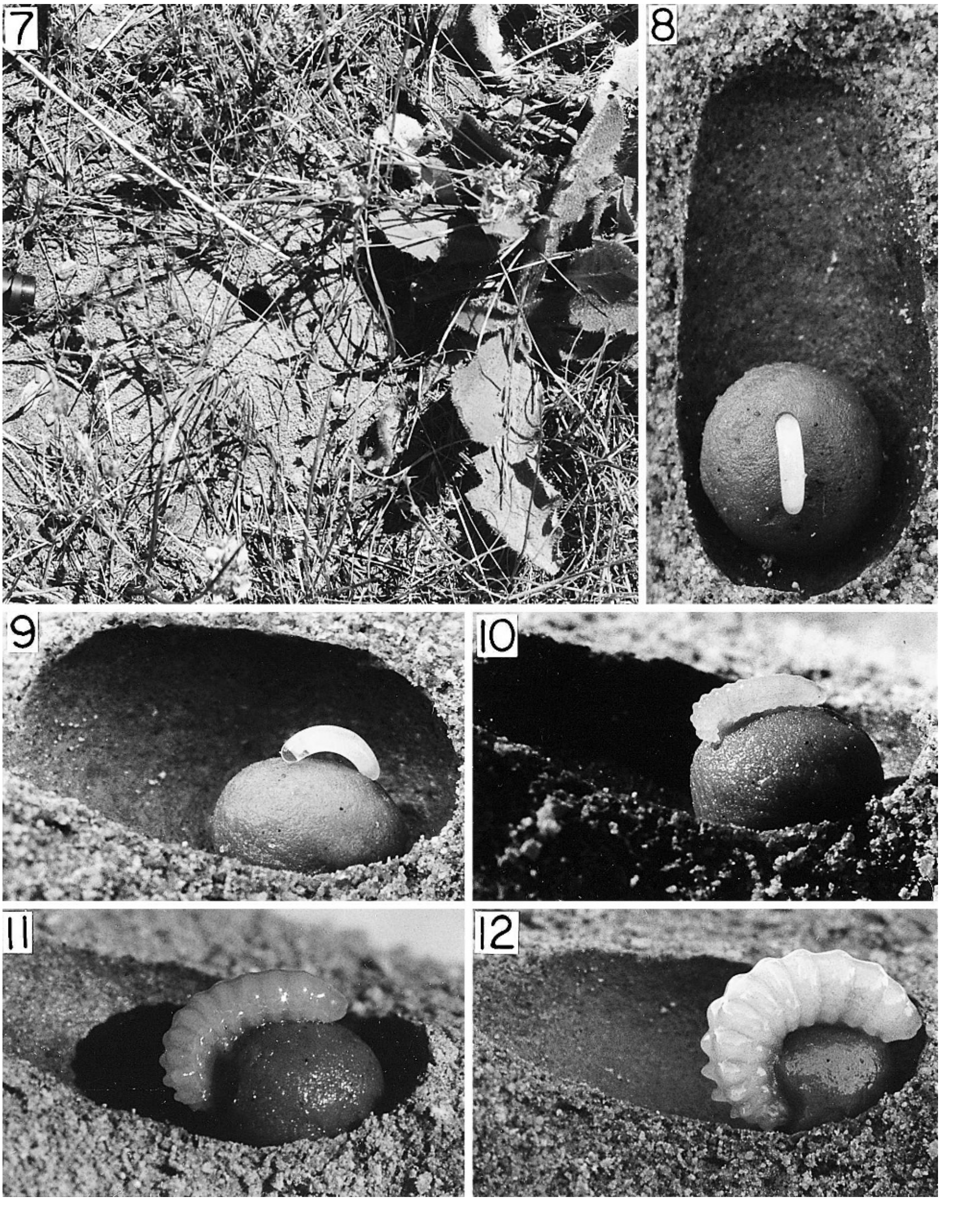
Two Kitsap Co. nests, due to close proximity, were excavated together on 22 July 1988, five days after discovery. Both bees were alive, one inside an open, unprovisioned cell, and the second at the end of the main burrow. Main burrows of both nests were free of loose soil. The third nest was excavated on 29 July 1988, also five days after discovery. Much of the main burrow was filled with loose to fairly well compacted soil. The bee was not recovered, and this nest may have been abandoned after it was completed and partly filled with soil.

Andrena prunorum cells (Fig. 8) were oriented with their long axes slightly declined below horizontal ($\sim 10°$). Mean cell length (16.74 mm; 15–18.8 mm; $n = 7$) was approximately twice the mean maximum diameter (8.61 mm; 8.4–8.9 mm; $n = 9$). Cells diameter was narrower at the closure where it averaged 6.25 mm (6.1–6.4 mm; $n = 4$). The inner surface of the cell, to which a waterproof secretion had been applied, was very smooth. A drop of water placed in each of nine cells beaded up in seven cases and was not absorbed for at least 30 minutes. In the other two cells the droplet spread out and was slowly absorbed. The cell closure consisted of a spiral arrangement of soil particles placed across the mouth of the cell and had not been waterproofed.

PROVISION MASS AND IMMATURE STAGES: Nine completed provision masses from Edmonds and three from Kitsap Co. were examined. All masses were similar and consisted of firmly packed pollen that had been moistened to a doughy consistency, presumably with nectar. Little free liquid was associated with a provision mass, which could be handled gently with a forceps without distortion. The mass was placed in the lower (rear) part of the cell. Viewed from above, 10 provision masses were sub-circular in shape with maximum diameters of 4.5 to 7 mm and minimum diameters that differed by less than 0.5 mm from respective maxima



Figs. 1–6. Nest structure in *Andrena prunorum*. Scale (2 cm) applies to all Figures. Dashed lines indicate approximate positions. 1. Vertical section through Kitsap Co. nest #3 showing the tumulus and the course of the main burrow to the most recent cell. 2. Horizontal plan of the Fig. 1 nest showing the cell arrangement and the course of the main burrow to the most recent cell. 3. Vertical section through a 1985 Edmonds nest showing the course of the main burrow to the most recent cell (tumulus was dispersed by the time of excavation and is not shown). 4. Horizontal plan of the Fig. 3 nest showing the cell arrangement and the course of the main burrow to the most recent cell. 5. Horizontal plan of the 1990 Edmonds nest showing the cell arrangement and the course of the main burrow to the most recent cell. 6. Vertical section through the Fig. 5 nest showing the course of the main burrow to the most recent cell (tumulus was dispersed by the time of excavation and is not shown).



Figs. 7–12. Tumulus, provision mass and larval feeding in *Andrena prunorum*. 7. Tumulus of a Kitsap Co. nest seen from above. The nest entrance is the black circle at left center. Note the degree of vegetative cover and the *Hypochaeris radicata* plant to the right of the nest entrance. 8. Top view of a cell with a provision mass and an egg (in situ). 9. Lateral view of a cell with a provision mass and an egg (in situ). 10–12. Successive stages (approximately two, three, and four days post eclosion) of larval feeding (lateral views). Note that larval orientation atop the provision mass does not change. Figs. 8–12 are of the same cell and are at the same magnification.

(Fig. 8). Two masses were more oblong, one measuring 4.5 × 5.5 mm and the second 6.5 × 8.5 mm. Masses were shaped into flattened spheres 3.5 to 5.5 mm thick (n = 7) and had smoothly worked surfaces. One incomplete mass, 5.1 mm in diameter, was subspherical in shape with a smooth surface. Four complete masses weighed 0.1454 g, 0.1610 g, 0.1617 g, and 0.194 g. The incomplete mass weighed 0.078 g.

Both ends of the markedly curved egg contacted the provision mass (Fig. 9). The egg's posterior end, toward the rear of the provision mass, appeared to be slightly embedded in its surface, while the anterior end, toward the front of the mass, appeared only to make slight contact. The egg's long axis was oriented roughly parallel to the long axis of the cell (Fig. 8). One egg measured 3 mm long and slightly less than 1 mm in maximum diameter.

Incomplete observations were made of larval feeding. The newly eclosed larva lay atop the middle part of the provision mass with its long axis roughly parallel to the long axis of the cell. The larva's head was toward the cell closure, and feeding began just beneath the head. The orientation of the larva changed little until a considerable amount of provisions had been consumed (Figs. 10, 11, 12). Size increase during this time allowed the larva to reach progressively farther forward and downward at the front of the mass, while side to side movement of the head allowed it to reach farther laterally. As more provisions are consumed the larva's position atop the mass may become unstable. During the latter stages of feeding the larva was wrapped tightly around the remains of the provisions, and its orientation changed frequently until feeding was completed. This general outline of larval feeding agrees well with that observed for *A. vicina* (Miliczky and Osgood, 1995).

Prior to defecation the larva rested on its dorsal surface with its head toward the mouth of the cell and its tail toward the rear. One larva began to defecate at least two days after it completed feeding. Feces are placed against the rear of the cell. One deposit measured 7 mm side-to-side and 8 mm top to bottom with a maximum thickness of 1.5 mm. The bulk of this deposit was a dull yellow material of uniform consistency, probably pollen remains, but an additional residue of grayish-white material was present on its surface.

PARASITES: Parasitic bee activity was not observed at Edmonds during 1985 or 1990. At Kitsap Co., however, a female *Nomada* sp. nr. *calloxantha* Ckll. was captured on 24 July 1988 in the vicinity of the nests, and two of five cells from one nest contained *Nomada* larvae. Both were reared to male *Nomada* sp. nr. *calloxantha*.

Feeding behavior of *Nomada* larvae differed from that of *Andrena*. The *Nomada* larva was mobile from an early stage and moved over the surface of the provision mass more or less continuously, feeding as it moved. By the time it is half-grown the larva is wrapped around the remaining provisions. Also in contrast to *Andrena*, *Nomada* larvae began to defecate well before feeding was complete. Perhaps 25–30% of the provisions remained when the first fecal pellets (~1 mm long by ~0.5 mm wide) were deposited. Defecation required 2–4 days. Fecal pellets were deposited over most of the cell's interior except near the cell closure (upper parts of both cells had been removed to allow observation). The postdefecating larva lay on its dorsum with the head toward the cell closure and the anterior end bent upward. Just after defecation the larva was creamy-white and flaccid, but within a day or two it acquired a distinct yellowish tinge and began to stiffen. When this change was complete the larva's rigid body was unresponsive to gentle prodding. Both larvae reached this state by 12 August 1988, and both pupated during the week that ended 29 August. Adults emerged between 12 and 18 September 1988, and the parasite, like its host, overwinters as an adult.

Discussion

Several aspects of the behavior and nesting biology of *Andrena prunorum* fall within the range of variation that has been observed among other members of the genus. Male behavior, mating, nest and cell structure, form of the provision mass, egg placement, and larval feeding do not appear markedly different from what has been reported for other *Andrena* (Davis and LaBerge, 1975; Miliczky, 1988; Batra, 1990; Miliczky and Osgood, 1995). It is of interest, however, to make some comparisons with other *Plastandrena* and between the two populations of *A. prunorum* studied for this report.

Plastandrena is a holarctic subgenus with five species in the New World (LaBerge, 1969). Osgood (1989) studied *Andrena* (*Plastandrena*) *crataegi* Robertson in Maine, and Hirashima (1962) reported on *Andrena* (*Plastandrena*) *astragalina* Hirashima in Japan.

Andrena prunorum and *A. astragalina* are solitary nesters (Michener, 1974). Osgood (1989), however, found *A. crataegi* nesting communally in Maine with up to 44 females in a nest. Communal nests of *A. crataegi* have also been found in Washington (Miliczky, unpubl. data). In a communal species several females of the same generation utilize a common nest, but each provisions her own cells (Michener, 1974). *Andrena* (*Callandrena*) *accepta* Viereck nested communally in Arizona (Rozen, 1973) as did the European *Andrena scotica* Perkins (Paxton *et al.*, 1996) and *Andrena agilissima* Scopoli (Giovanetti *et al.*, 1999). Communal nesting is also known in *Perdita* (Andrenidae: Panurginae) (Custer, 1928; Michener, 1963; Danforth, 1991).

Andrena prunorum nested in level ground at both sites, and *A. crataegi* nests were in ground that was generally so (Osgood, 1989; Fig. 8). *Andrena astragalina* nests occurred in both horizontal and vertical surfaces. Burrows in vertical surfaces angled upward for a short distance before turning downward, an interesting feature (Hirashima, 1962). Variation in nesting substrate orientation has been reported infrequently in solitary bees, perhaps in part due to the fact that few species have been studied at more than one location. *Andrena* (*Leucandrena*) *barbilabris* (Kirby) nested in near vertical sand cliffs in California (Thorp and Stage, 1968, as *A. placida*) and in the sandy substrate beneath the horizontal bricking of a patio in Washington (Miliczky, unpubl. data). *Habropoda depressa* Fowler (Apidae) also nested in horizontal and near-vertical substrates (Barthell *et al.*, 1998).

Hirashima (1962) described cell arrangement in *Andrena astragalina* as "end by end" and illustrated a nest with four cells that appeared to be in linear series. He considered such an arrangement typical of most *Andrena*. However, many *Andrena* clearly construct single cells at the ends of separate lengths of burrow (lateral burrows) (Batra, 1999; Miliczky and Osgood, 1995; Stephen, 1966; Davis and LaBerge, 1975). *Andrena prunorum* cells were clearly constructed at the ends of separate lateral burrows, and Osgood (1989) indicated likewise for *A. crataegi*.

The two *Andrena prunorum* nesting sites differed markedly in vegetative cover, but at both locations the soil was sandy with, presumably, favorable drainage characteristics. The latter fact may have been of particular importance to the spring-active Edmonds bees which were faced with cool, changeable weather and the likelihood of rainy periods, sometimes several days in duration. The Kitsap Co. bees, in contrast, were active in mid-summer when local weather is often warm and dry for extended periods. Cane (1991) analyzed nesting soils of 32 species of bees. These included *A. prunorum* from a site near Palm Desert, CA where the soil was 86.6% sand, the sixth highest percentage among the surveyed species (high of 93.8%). Soil moisture content at this site was 3%, was the second lowest recorded.

Andrena prunorum may have potential as a pollinator of certain crops. Bohart *et al.* (1970) rated it a more efficient pollinator of cultivated onion than the honeybee. (Wild onion (*Allium* sp.) was an important pollen source for *A. prunorum* in southeastern Wyoming (Tepedino, 1982).) Menke (1952) observed *A. prunorum* visiting apple bloom throughout eastern Washington. The species appeared to be an effective pollinator of apple, although its rate of flower visitation was lower than by some other native bees (Miliczky, unpubl. data).

The active season of *Andrena prunorum* indicates the possibility of two generations per year. Adult activity at Edmonds extended from early or mid-April to late May or early June. Bees of the putative new generation pupate by mid-June and reach adulthood by mid-July based on excavated and reared specimens. In contrast, reared specimens of *A. vicina* from the same site did not reach adulthood until late August (Miliczky and Osgood, 1995). Unfortunately, no field observations at Edmonds were conducted after mid-June, and for Kitsap Co. where adult activity was observed in mid-July, nothing is known regarding activity earlier in the season. Collection data from Yakima Co. also indicates a lengthy period of adult activity. Possible phenologies suggested for *A. prunorum* in the southern part of its range by LaBerge (1969) included two generations per year, a partial second generation, or extended emergence of a single generation. Two generations per year have been reported for certain North American *Andrena* (Linsley, 1937; Youssef and Bohart, 1968) and several British species (Perkins, 1919). The occurrence of two generations per year could be confirmed by season-long observations at a nesting site or possibly by regular collecting throughout the season at a location where the species is common.

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